

**Replies to the questions of the Romanian Ministry of Environment, Waters and Forests**

**Ministry of Environment, Waters and Forests letter received 23 December 2015**

**Document entitled “Answers to the questions of Romanian Ministry of Environment, Waters and Forests”**

<p><b>1</b></p>	<p>Pct.9 lit.c <i>“How, do you intend to ensure long-term monitoring of emissions from radioactive waste, as well as those of R-222 and R-220 resulting from barriers”</i></p>	<p>Bulgaria is a member of International Atomic Energy Agency (IAEA) and a member of the European Union. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management is ratified with a Law adopted by the 38<sup>th</sup> National Assembly of Republic of Bulgaria. Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste is obligatory and is transposed into national legal framework. The process of management of radioactive waste, including design, construction, operation and closure of the National disposal facility is performed by observing the safety standards of the IAEA, incl. standards that relate to the monitoring of the facility as Environmental and Source Monitoring for Purpose of Radiation Protection, IAEA RS-G-1.8, 2005 and Monitoring and Surveillance of Radioactive Waste Disposal Facilities, IAEA No.SSG-31, 2014.</p> <p>In line with the above cited safety standards of IAEA, the recommendations of IAEA like Surveillance and Monitoring of Near Surface Disposal Facilities for Radioactive Waste, IAEA, SRS No.35, 2004; Programs and Systems for Source and Environmental Radiation Monitoring, IAEASRS No.64, 2010 as well as with the national legal framework, SERAW is obliged to develop and implement monitoring programs in all stages of the life cycle of a national disposal facility. This includes: (1) programs for predisposal monitoring covering the period before the commissioning of the disposal facility; (2) programs for disposal monitoring during operation of the disposal facility; (3) monitoring programs in the period of closure of the disposal facility; (4) monitoring programs after closure of the facility in the period of institutional control. These programs are subject of control of Bulgarian Nuclear Regulatory Agency and are part of the documentations to the application for a permit for commissioning, application for license for operation, applications for</p>
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		<p>renewal of the license for operation, application for decommissioning/ closure of the disposal facility.</p> <p>The question <i>“How, do you intend to ensure long-term monitoring of emissions from radioactive waste, as well as those of R-222 and R-220 resulting from barriers”</i> concerns the period of operation of the facility as well as the period of closure and the period after closure of the facility. The long-term monitoring is implemented in the following manners described in the EIA Report: (1) by the monitoring programs; (2) by the system of control of the engineering barriers of the disposal facility.</p> <p>As described above, the implementation of the monitoring programs is responsibility of SERAW, arising from the international standards and national legal framework and its implementation is monitored by the Nuclear Regulatory Agency. The monitoring programs are described in the Environmental Impact Assessment Report (EIA Report). In line with the IAEA recommendations and the requirements of the national legal framework they cover monitoring of the NDF site and of the monitoring zone which is with radius less than 4 km. As described in the EIA Report, the monitoring covers the following objects of the environment:</p> <ul style="list-style-type: none"> <li>- Radiation gamma background (measured with thermoluminescent dosimeters (TLD) and field (in situ) measurements)</li> <li>- measurement of specific, or volume radioactivity of key radionuclides in soils;</li> <li>- measurement of specific, or volume radioactivity of key radionuclides in natural waterways - the waters of Danube River;</li> <li>- measurement of specific, or volume radioactivity of key radionuclides in drinking water,</li> <li>- measurement of specific, or volume radioactivity of key radionuclides in ground water. There is a system of 12 monitoring boreholes (piezometers) installed for control and monitoring of the groundwaters. The systems is constructed in line with the requirements of Regulation No 8 on the conditions and requirements for construction and operation of landfills and other facilities and installations for waste</li> </ul>
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		<p>is 0.005 to the collector, allowing gravity to drain the collected water. The following is subject of control: (1) presence of water in the vessel; (2) radioactivity of the potentially penetrated water collected in the vessel; (3) the quantity of water and eventually the presence of radioactive contamination in the vessel; In case of presence of radioactive contamination waters are transported to Specialized division RAW Kozloduy for processing.</p> <p>The system for control of infiltration designed that way allows the control of the engineering barriers and possible emissions of the engineering barriers not only in the period of operation of the facility and also in the periods of closure and post-closure of the facility in the period for institutional control. The system for control of the infiltration is designed for the entire life cycle of the disposal facility - design life of the gallery is 375 years. The placement of the piping system in an inspection gallery provides for carrying out a control and maintenance. This resolves the issue with control of emission of engineering barriers.</p> <p>The question of emission control of R-222 and R-220 from the engineering barriers is unclear as there are no such elements in the Periodic table of elements. Most probably Rn-222 and Rn-220 are meant, which are extremely short-lived radionuclides (the half-life of Radon-222 is 3.82 days, and the half-life of Radon-220 is only 54 sec) and decay fast. Radon is product of the radioactive decay of Thorium, which concentration in the waste, subject of disposal in the NDF is below the free release limits. As a daughter product of Thorium, concentration of Radon is also below the free release limits and is not subject of control. We would like to emphasize that the NDF is intended for disposal of only low and intermediate level waste category 2a and not for disposal of long-lived waste.</p>
2	<p>Pct.9 lit.e "How is planned to be conducted the environmental radioactivity monitoring in and around the repository in the last 10 years of its operation (under Part VI,</p>	<p>About the radiological environmental monitoring program please refer to the answer of the previous question.</p> <p>Regarding the presumed degradation of the safety of the containers after 50 years, we would like to state categorically, that probably this issue is not clearly understood, the statement does not correspond with the reality and it is not based on the information for the protective multi-barrier engineering system of the facility</p>

	<p>the estimated life time of the repository is 60 years) in the area where already exist containers which have reached the age of 50 years and for which we already know that their security is compromised”.</p>	<p>presented in the Environmental Impact Assessment Report. The design basis of the reinforced concrete containers require at least 50 years operation without maintenance/repair of the metal bearing ears, used for operations of lifting, relocation and transportation of the containers. In other words, the minimal lifetime for transportation and handling operations (handling with the metal bearing ears) is 50 years. This lifetime can be extended easily by measures for maintenance of the metal bearing ears including replacement of the corrosion protection coating. The lifetime of the reinforced concrete containers regarding their containment function according to the technical design of the reinforced concrete containers is 300 years. At conditions of Radiana site, the main degradation mechanism of the reinforced concrete is carbonation that is a rather slow process and defines stability for substantially more than 300 (three hundred) years.</p> <p>Based on the above mentioned, there are no reasons for changes of the radiological environmental monitoring program during the last 10 years of operation of the facility.</p>
<p><b>3</b></p>	<p>In accordance with point 28 of the outline of the subcrustale seismic Vrancea, of the source Radulian, M.Mindrescu, N.Panza, G.F.Popescu, E.Utale., (200) Characterization of Romanian Seismic zones, Pure Applied Geophysics, 157, 57-77 (contour used in calculation of hazard for versions 2006 and 2013 of seismic zoning Map of the territory of Romania) median distance from the seismic source Kozloduy subrustal</p>	<p>A) The EIA Report states that "According seismic cards for periods of 1000 and 10,000 years, the investment proposal is located within an area with intensity of expected seismic impacts of level VII according scale MШK-64, where buildings and equipment are provided with seismic coefficient <math>K_c = 0.10</math>." These maps are presented in Figure 1 and Figure 2 of the attached file with figures (Attachment 1). The maps show, that the NDF site which is close to the town of Kozloduy is in an area with intensity of expected seismic impact of level VII according scale MШK-64, respectively - seismic coefficient <math>K_c = 0.10</math></p> <p>B) In the regulatory document „БДC EN 1998-1:2005/NA: 2012. Eurocode 8. Design of structures for seismic resistance” which is in force after 2012, are presented three maps for seismic zoning of the country with values for the reference maximum ground acceleration for return periods of 95, 475 and 1000 years (presented respectively in Figure 3, Figure 4 and Figure 5 of Attachment 1). The three maps show that the NDF site is situated in an area where the maximum ground</p>

<p>Vrancea is 303 km (minimum distance of 249 km, maximum 360 of distance).</p> <p>For the earthquake of 4 March 1977 the EIA report mentions values of IMSK 6...7. Converted in values of maximum horizontal acceleration of land, it means that the median values ranging from 0.07 and 0.12g. Median plus standard deviation ranges between 0.11g and 0.21 g (it is generally a very high variability of maximum acceleration values for the same value of microseismic intensity). The EIA report says that it has been used a seismic coefficient of 0.1.</p> <p>It is necessary to clarify certain matters relating the meaning of this coefficient was identical in the two States. At the same time it should be noted what id the average recurrence interval or the average period of recovery of the value of the maximum acceleration of the land</p>	<p>acceleration is in the following range: 0.05÷0.09 for return period of 95 years; 0.09÷0.13 for return period of 475 years; 0.1÷0.13 za for return period of 1000 years.</p> <p>C) The values of maximum peak ground accelerations (PGA) for the design of NDF structures are based on the results of the seismic microzonation performed (within the frame of IAEA technical co-operation project) for the adjacent Kozloduy NPP as follows: seismic level 2 (SL 2) for safe shutdown events PGA= 0.2g; seismic level 1 (SL 1) for design basis earthquakes PGA= 0.1g. All safety related structures of NDF such as waste packages, disposal cells, foundation cushion, multilayer earth cover (Seismic Category 1 structures) are designed for seismic level SL2 (PGA= 0.2g). The non-safety class structures (Seismic Category 2) are designed for seismic level SL1 (PGA= 0.1g). The structures which are not Seismic Category 1 and 2 are classified as Non Seismic Category. These structures are designed to withstand seismic event according to BDS EN 1998-1 and the Bulgarian National Annex to BDS EN 1998-1:2005/NA: 2012.</p>
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	for the seismic coefficient.	
4	Point 29. Where there is water flowing through storage cells, according to the IAEA rules, cracks should not be accepted.	<p>1) The disposal system is designed in such way as to not have water flowing through the disposal cells at the National Disposal Facility. The main purpose of the NDF is to isolate the radioactive waste from the environment and the human biosphere, which includes isolating the ingress of water to the disposed radioactive waste. This is described in details in the EIA Report and is based on the characteristics of the site, which is selected as a result of a procedure of selection; on the characteristics of the engineering facility for disposal of radioactive waste and the characteristics of the multilayer cover. Additionally, as described in the EIA Report and in the answer to question 1, all measures are taken so the water eventually penetrated in the disposal facility to be captured and controlled through a drainage system and infiltration control system, located in the inspection galleries beneath the disposal cells.</p> <p>2) All the elements of the disposal system are designed with strict compliance with the requirement to prevent cracks. This applies to the loes-cement cushion, bottom plate, walls, protective cover panels and roof slab of the disposal cells, the protective multilayer cover.</p> <p>3) As for reinforced concrete structures - in our response to question 29 of the Romanian side from May 2015 are brought all the characteristics of concrete and steel reinforcement, which will be used in the construction of the NDF and their compliance with international requirements is presented.</p> <p>It is well known that concretes contain micro-cracks, the dimensions of which are different depending on the class of the concrete. In the case of the NDF, the designer has chosen such class of concrete and reinforcement, which provide an opportunity for high quality performance, which does not allow micro-cracks with sizes larger than 0.15 mm. The design concrete characteristics of the disposal cells including the limit value of the concrete microcracks entirely satisfy all the requirements of nuclear recommendations (IAEA-TEC DOC 1255, NEA/CSNI/R(2002)7/VOL2, American Nuclear Code ACI-349) as well as civil construction standards (such as</p>



		<p>EuroCode EN 1992-1, American Code ACI-318, German Code DIN 1045, Spanish Code EHE-08). The concrete for disposal cells is classified as water impermeable and is used in structures where the water impermeability is absolutely essential and the requirements are very high.</p> <p>4) Not least, it should be noted that additional measures have been taken for hydrosolation of the system through layers of internal and external hydroisolation.</p>
5	<p>Point 30. The two periods of average return of 95 years and 475 years are recommended by EN-1998-1 for the status and condition of service limit and state-limit (safety of life). Acceleration values specified in the EIA documentation for return periods of 95 years and 475 years lower values are determined in Romania (at Bechet jud. Dolj county), village in the area monitored by the 30 km), respectively of 0.125 g and 0.21 g under technical regulation “seismic design Code - part I- design provisions for buildings. Call sign P 100-1/2013”. For the return of the 225 years old at Cachet was 0.16 g value, near the superior izoline value enhancement of 0.20g of “seismic zoning map of the territory of</p>	<p><u>Please see answer of Question No 3</u> and additionally:</p> <p>For the purposes of analysis of seismic hazard of the response spectra on the KNPP site used real normalized response spectra of records of intermediate-focus Vrancea earthquakes, modeled such for local and other shallow sources. From the resulting hazard curves for spectral accelerations are defined also the uniform hazard response spectra for the five types of sources (Vrancea intermediate-focus earthquakes, Vrancea shallow, Bulgarian, Other, Local earthquakes) with annual probability of exceeding <math>10^{-2}</math>, <math>10^{-3}</math> and <math>10^{-4}</math>.</p>

	<p>Romania". The given answer does not mean clearly the values of the acceleration that are used for designing of the facility/ warehouse/ cells where you will store the radioactive waste, so as to ensure compliance with the rules imposed by the IAEA, taking into account the effects of potential strong earthquake from Vrancea subcrustal seismic source.</p>	
<p><b>In addition, from the analysis of the revised RIM, the following request answers:</b></p>		
<p><b>6</b></p>	<p>It is starting for the false premise that the project will have no impact across borders, and the argument about the "considerable" distance towards protected areas located in Romania (19.5 km respectively) cannot be taken into account when the objective has such nature (repository of radioactive waste). The answer given by the Bulgarian side is represented by a simple conclusion that the project will not have a cumulative impact, nor across borders, that isn't supported by a</p>	<p>For the investment proposal of SERAW for construction of the NDF is prepared an assessment of the degree of impact of the investment proposal in the closest protected areas on the territory of Bulgaria (ADI), which is in full compliance with the requirements of the national legal framework in this field – Law on biodiversity (prom. SG issue 77/ 9 August 2002) and Ordinance on provisions and order for conduction of compatibility assessment of plans, programs, projects and investment proposals with the matter and aims of protection of protected zones (promulgated State Gazette, issue 73, September 11th 2007).</p> <p>This is confirmed by the positive quality assessment of the EIA Report, presented on the 9<sup>th</sup> of February 2015 by the Ministry of Environment and Waters, integral part of the EIA Report being the Report of assessment the degree of impact. In turn, both previously mentioned regulatory documents are fully synchronized with the requirements of Directive 2009/147/ EC on the conservation of wild birds and Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora for the European ecological network Natura 2000, including procedures for impact assessment on the areas and the object and purpose of their protection as a result of the implementation of plans, projects and investment proposals for determining the</p>

<p>related study and cannot be justified by a guess. Taking into account that Bulgaria is a member State of the European Union, for this project is required to comply with art.6(3) and (4) of the Habitats Directive (92/43/EEC) concerning the assessment of the impact of this project on biodiversity and revised EIA report request reconsideration, request made by Romania and MEWF through address n.3715/GLG/27.05.2015 (page 2, point a,b and c) and the Verdict no.15645 issued from 26.11.2013 by the Court of Bulgaria</p>	<p>eligibility of these impacts and take appropriate compensatory measures in case of expected significant impact. In this sense the Report on assessment of the degree of impact fully corresponds to the requirements of Art. 6 (3) and (4) of the Habitats Directive (92/43/EEC), which is why we believe that the non-compliance, stated by Romania is totally unacceptable.</p> <p>The conclusion in the ADI Report is that with applying of the design technologies for construction and operation as well with the implementation of the mitigation measures, planned in the assessment, implementation of the NDF does not imply direct and indirect impacts, and <b>there is no cumulation with such on the closest protected areas on the territory of Bulgaria</b>, it can't be expected negative transboundary impact <b>(including cumulative)</b> over the closest protected areas from Natura 2000 on the territory of Romania. <b>This conclusion is based on the fact, that the closest protected areas direction Romania, on which is not expected any impact, are located at respectively 0.45 km south and west from the site (PA BG0002009 Zlatiata for conservation of wild birds) and at a distance of 3.8 km (PA BG0000533 Kozloduy Islands on conservation of habitats and wild flora and fauna to the north, whereas the closest Romanian areas are even more remote in the same directions.</b> On Romanian territory, on the other side of the River Danube, 5.5 km and 18 km to the north and northwest of the NDF site are located three protected areas of the European ecological network NATURA 2000 (one of them overlaps the other two):</p> <ol style="list-style-type: none"> <li>1. PA ROSCI0045 „Coridorul Jiului” declared under Directive 92/43/EC on the conservation of habitats and wild flora and fauna.</li> <li>2. PA ROSPA0023 „Confluența Jiu – Dunăre” declared under Directive 2009/147/EC on the conservation of wild birds.</li> <li>3. PA ROSPA0010 Bistreț declared under Directive 2009/147/EC on the conservation of wild birds.</li> </ol> <p>Practically, there is no logical reason to expect any additional impacts, including cumulative on the object and purpose of protection of areas which are located beyond already assessed areas with similar subject and conservation objectives for</p>
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		<p>which it was demonstrated that with applying of appropriate mitigation measures during the implementation of the investment proposal their protection parameters will not be affected negatively.</p> <p>*It is important also to note here, that in the Report Assessment of the degree of Impact of Investment Proposal on the Subject and Purposes for Conservation of Protected Areas as well as well as in the EIA Report (at least in the part reviewing the protected territories and areas) there is no statement that the NDF will not have any impact, because it is located at a considerable distance from the protected zones in Romania (resp. 19,5 km) – probably it is considered an old, outdated document.</p> <p>The Report for Assessment of the degree of impact of investment proposal on the subject and purposes for conservation of protected areas as well as the EIA Report include conclusions of different experts concerning the assessment of the investment proposal over the different components and factors of the environment, that no transboundary impact is expected. With respect to atmospheric air (no emissions), water (no generation of waste water directly discharged into Danube river, no water intake from the river), which is a prerequisite that there is no impact of the NDF over the mentioned components of the environment, which is a sure guarantee that there will be an impact on Protected areas on Romanian territory, located at a greater distance than the protected areas on Bulgarian territory for which the experts have proven in the assessment report that the investment proposal will not have negative impact.</p> <p>It should be taken in consideration that in Bulgaria, according to national environmental legislation, the assessments under Directive 92/43/EEC on conservation of habitats and wild fauna and flora, Directive 2009/147/EEC on the conservation of wild birds and the assessment as per Directive 2011/92/EEC are combined, and with prepared independent Report for Assessment of the degree of impact of investment proposal on the subject and purposes for conservation of protected areas, it shall be considered an integral part of the EIA Report, as required by the Environmental Protection Act and the Regulation for Environmental impact assessment which set the procedure for the Environmental impact assessment. In</p>
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<p><b>7</b></p>	<p>In the EIA study, you have been several times stating that the measures values of environmental factors such as: air, water, vegetation, soil, animal species are within limits. This is the reason why you concluded that it is not necessary to calculate impact study of all activity form Kozloduy nuclear facilities area.</p> <p>Please submit the possibility of event, an attack or extreme natural disaster, highly, which can occur and affect at the same time all nuclear facilities in the area.</p>	<p>Given that fact the investment proposal for the construction of the NDF is located near the NPP "Kozloduy", the EIA report describes the monitoring programs implemented by KNPP and there are presented long-term results of measurements of objects of the environment such as air, water, soil, vegetation, food, animal species. The EIA Report emphasizes many times that the results show lack of negative impact over the environment as a result of the operation of KNPP. The monitoring results are not and could not be used as a justification why not to estimate the cumulative effect. They can only prove that so far there is no negative impact over the environment as a result of the operation of the KNPP and can be used as a reasonable statement, that there are no reasons that the continued operation of KNPP will result in negative environmental impacts.</p> <p>The cumulative effect is discussed in detail in Chapter VI of EIA Report. We will not dwell on the examined cumulations over the components of the environment (atmospheric air, waters, subsoil, land and soils, noise, landscape and biodiversity, as well as accumulation in terms of environmental factors - non-radioactive and radioactive waste and hazardous chemical substances and mixtures because the issue is related to radiological impact on the population.</p> <p>It should be definitely noted that the Bulgarian nuclear legislation contains a restriction on the maximum cumulative effect of all nuclear facilities on a given site. This restriction complies with the international requirements defined in the safety standard of IAEA Radiation protection and safety of radiation sources, International Basic Safety Standards, IAEA GSR Part 3 and Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation – the limit of the annual effective dose for any individual of the population is 1 mSv.</p>

	<p>Based on this dose limit for all nuclear facilities on the site for the NDF is defined a value for the radiological impact on the population of maximum 0.1 mSv/year. The cumulative impact analyzed in the EIA Report is significantly lower than the regulatory limit. As described in the EIA Report, the radiological impact on the population during normal operation of the NDF is analyzed in the Interim Safety Analysis Report exclusively for external radiation as no gas and liquid emissions from the NDF in normal operation are expected. This impact is localized within the site of the NDF and practically, there is no cumulative effect on the population in the surveillance zone. The total annual dose was determined to be 18 <math>\mu</math>Sv (<math>\approx</math>0.02 mSv) of direct radiation and is well below the secondary constraint (100 <math>\mu</math>Sv/ year) for the NDF.</p> <p>For conservative assessment of the cumulative effect of exposure of the population of all radioactive releases into the environment under all operating conditions of the NPP are taken into account all nuclear facilities:</p> <ul style="list-style-type: none"> <li>- NDF on Radiana site</li> <li>- The operating facilities on the site of KNPP – Units 5 and 6; Spent Fuel Storage Facility, Dry Spent Fuel Storage Facility;</li> <li>- All activities of decommissioning of Units 1-4 (Size reduction and decontamination workshop)</li> <li>- Emissions from the operation of the plasma facility</li> <li>- New nuclear facility – maximum value for EUR limits of release.</li> </ul> <p>The maximum annual effective dose for the population around the KNPP, including the NDF site, even in this highly conservative (practically impossible) scenario for a reference individual staying permanently on the boundary of the NDF site as a result of all radioactive emissions in the environment cumulated with all nuclear facilities on the KNPP site Units 5 and 6, Decommissioning Units 1-4, Plasma facility, new nuclear power and NDF is estimated at 20.88 <math>\mu</math>Sv/a, which is far less than the quote of 100 <math>\mu</math>Sv/a for NDF, 250 <math>\mu</math>Sv/a from exposure of radioactive releases from the nuclear power plant (Regulation on ensuring the safety of nuclear power plants (Prom. SG. 66 of 30 July 2004., last. amend. SG. issue 5 of 19 January 2010) and the</p>
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		<p>limit for the population 1000 <math>\mu\text{Sv}/\text{a}</math> (Regulation for the basic standards of radiation protection – 2012). The obtained additional dose rate is about 100 times lower than the natural radiological background (2330 <math>\mu\text{Sv}</math>).</p> <p>The question of the probability of a severe accident - an event, attack or a severe natural disaster asked in line with the cumulative impact, raises bewilderment as the legal framework, both national and international, requires consideration of the cumulative effect of the normal operation of all nuclear facilities site on the KNPP site.</p> <p>The accidents are examined in another chapter of the EIA Report as well as safety assessments that are subject to licensing by the competent authority - the Nuclear Regulatory Agency. Safety assessments are developed based on the requirements of the national legal framework - Regulation for issuing licenses and permits for safe use of nuclear energy and the safety standards of the International Atomic Energy Agency, which both Bulgaria and Romania are members of. Accidents which are probable to occur are examined, either due to internal or external initiators such as attack or natural disaster, not a hypothetical emergency situations that can occur on the site.</p> <p>The examined potential accidents and incidents during the operation of the NDF - seismic risk, floods, extreme winds and tornadoes, human intervention - plane crash, fall of container and beyond design basis accident - a fall of large aircraft, radiological consequences are localized within the NDF site. This is because SERAW expressly requested from the designer to develop the design of the repository so that the precautionary measures zone to be within the fence of the Radiana site. Accidents situations are such that they can not affect or cause damage to nuclear facilities, which are located on the site of KNPP. Destruction of infrastructure, loss of electricity, and similar results from extreme events do not result in emission of radioactive substances from the NDF neither in short nor in long term.</p> <p>The accidents considered in the EIA Report of the investment proposal for construction of a new nuclear power facility of the latest generation at the KNPP site such as falling of aircraft, explosions and fires, floods, extreme winds and tornadoes</p>
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		<p>can not affect simultaneously all nuclear facilities in the area.</p> <p>The existing NPP "Kozloduy" is operated without accidents for a considerable period of time. The analyzes in the report "European stress tests for nuclear power plants, 2010. National Report on Bulgaria " indicate that there are no accidents which could affect all the nuclear facilities in the area.</p> <p>The probability of falling of an aircraft according to the EIA Report of the new nuclear power facility is negligibly low <math>4 \cdot 10^{-8}</math>. And we would like to emphasize again that this event can not affect simultaneously all nuclear facilities and the probability of occurrence is significantly lower than the limit below which the events are not considered (<math>10^{-6}</math>).</p> <p>We would like to reiterate that the site where a nuclear facility is to be constructed is subject of procedure for site selection in accordance with the requirements of the national legal framework and safety standards of the International Atomic Energy Agency and is subject to licensing by the Nuclear Regulatory Agency. The EIA Report of the NDF from year 2015 includes detailed description of the steps of the procedure and the criteria for site selection. Even in the initial stage of the procedure for site selection is analyzed the territory of the whole country and the areas with unfavorable conditions for placement of a facility for disposal of radioactive waste are excluded, which means that even at an early stage are excluded areas where extreme natural disasters could occur which to destroy one or more nuclear facilities.</p>
8	<p>In the EIA study, you stated that the NDF presence does not interfere with the Romanian farms (especially those who practice organic farming and who are often accessing European funds) or with those developing tourism linked to the Danube, but also indicate that local Bulgarian tourism on the Danube may be</p>	<p>The question has two aspects: (1) the impact of the NDF on farms that develop organic farming, i.e. whether the NDF could have a negative impact on agricultural production; (2) The impact of the NDF on farms or firms developing tourism connected with the Danube River.</p> <p>In regards to the impact of the NDF on farms that develop organic or conventional agriculture it must be clearly stated that the Bulgarian side does not distinguish between Bulgarian and Romanian farmers and equally protects both the Bulgarian and Romanian agricultural production.</p>



<p>affected due to negative perception linked to production of the nuclear energy. Please provide clarification and identical measures adopted by the project owner to protect farmers from Romania and Bulgaria.</p>	<p>The investor of the project has taken all measures to design and subsequently construct and operate the NDF in a way that ensures safe isolation of radioactive waste from the environment and human biosphere. As it is described in details in the EIA report, this is based on the characteristics of the site where the disposal facility is located and which is determined after a procedure for site selection, the characteristics of the engineering facility for the disposal of radioactive waste and the characteristics of the protective multilayer cover.</p> <p>It is emphasized many times in the EIA Report that particularly for the NDF SERAW required from the designer to develop the design of the disposal facility so as the precautionary measures area to be limited within the boundary of the site.</p> <p>The EIA Report specifically considers the impact on the components of the environment - air, water, soil, vegetation, incl. agricultural production and it has been proven that the construction, operation and closure of the NDF do not have any negative impact. Chapter VI analyses the cumulative effect of the NDF operation with the other facilities on the KNPP site. The absence of cumulative effect and transboundary impact on Romanian territory is proven. The absence of impact on agricultural production from the construction of the NDF and the simultaneous operation of nuclear facilities in the area is proven. The results of the monitoring programs are given covering soils, vegetation, water, agricultural products, food, radiation exposure to the population, showing that, following the long-term operation of KNPP there is not any impact on the agricultural production.</p> <p>In support of the above, we would like to give specific examples of organic farms in our country. Certification of agricultural farmers as producers of organic products is in accordance with the application of the Law for applying the common organization of agricultural markets of the European Union and Ordinance № 1 dated 7 February 2013 for applying rules of organic production of plants, animals and aquaculture, plant and animal products, aquaculture products and foods, their labeling and control of production and labeling. This certification is not related to the distance of the farms to nuclear facilities. In our country we have biologically certified organic</p>
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	<p>farms in the area around KNPP, which is another proof of the lack of contamination of both agricultural production and soil, air and water in these farms.</p> <p>In support of the facts mentioned above and of the assessments made in the EIA Report, we would like to highlight examples from the international experience, which are addressed in the EIA Report. Both French disposal facilities for low and intermediate level waste are located in wine regions and their long-term operation has shown that the sales of wines and agricultural produce are not affected negatively by the presence of disposal facilities in these areas. The Spanish disposal facility El Cabril, which is the reference disposal facility for the NDF, is located in a hunting reserve and the surrounding area is known by the production of ecologically clean honey and olive plantations, which yield high quality olive oil. In close proximity to the disposal facility are located a large pig farm and factory for preparation of the famous Spanish jamon. The production and sales of these agricultural products are neither influenced negatively by the presence of the disposal facility, but production and exports expand.</p> <p>Regarding the impact of the NDF on farms and companies that develop tourism connected with the Danube River:</p> <p>Concerning the potential negative impact on tourism because of the negative attitude towards to nuclear energy production, we would like to emphasize that in the EIA Report of the NDF there is no such judgment expressed and that the National disposal facility is not a facility for production of nuclear energy. Moreover, the public opinion is not negative for the KNPP, which provides the cheapest electricity in the energy mix of the country.</p> <p>The measures taken by the Employer of the project for preserving the tourism along the Danube River, either Bulgarian or Romanian, are the same as the above mentioned, i.e. to design, construct and operate such a disposal facility, which to isolate safely the disposed radioactive waste from the environment and human biosphere. As stated above in this respons, the EIA Report has shown the absence of</p>
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		<p>a negative impact of the project proposal for the construction of the NDF on the environmental components, including the absence of cumulative effects and transboundary impacts. Information measures can be taken among the population to promote the absence of negative impact/ newsletters published on the website of the Employer/ upon request by Romania.</p> <p>In the EIA Report are presented the results from the safety assessments, including the Danube River in dosimetric model using the river for recreation, swimming and fishing and the related consuming of water and eating fish from the river. The results convincingly demonstrate the absence of influence of the NDF on the people using the river for recreation, bathing and fishing.</p> <p>In addition to these measures, the Danube River is included in the program for predisposal monitoring of the NDF and will be covered by the monitoring program during the operation of the disposal facility, the program for monitoring during its closure, as well as during the post-operation period.</p> <p>In addition to the above described measures for protection of tourism along the Danube River, which are identical for Bulgarian and Romanian tourists, we would like to refer again to the international experience and best practices that are described in the EIA Report. Both French disposal facilities are located in tourist areas and the tourism was not influenced by the disposal facilities. The Spanish reference disposal facility El Cabril, as we explained, is located in a hunting reserve, which visitations have not been declined due to the presence of a repository.</p>
9	<p>In the EIA study, you have stated many times that NDF operation does not impact on a larger area than 3 km zone and then in no need to monitor outside this perimeter, or any Romanian nearby are.</p> <p>However, you also stated that there</p>	<p>As shown in the EIA Report, the operation of the NDF has no negative impact onto the environmental components because of the used technology for disposal in passive multi barrier surface facility and the characteristics of the site, which is selected after a procedure for site selection. Not any considerable impact is registered during the long-term (over 40 years) operation of nearby Kozloduy NPP. All these aspects of impact are assessed in detail in the EIA Report and the cumulative effect of the operation of all facilities is assessed as negligible and</p>

	<p>are regular updates, regarding the condition and operation of the objective, for the mayors of the Bulgarian localities who are in the NDF are, same areas as the Romanian localities are. Please explain why does appear to be a double standard?</p>	<p>insignificant. There is no transboundary effect over the Romanian territories.</p> <p>As it is proven in the EIA Report, the precautionary action zone of the NDF is within the boundary of Radiana site, and the monitoring zone is with a radius less than 4km – both zones are totally on Bulgarian territory.</p> <p>The monitoring program is described in detail in the EIA Report and briefly described in the answer to question 1. It is stated, that there will be regular updates of the program. These regular updates are in line with the basic principles for management of radioactive waste, the safety standards of the International Atomic Energy Agency and the legal requirements. They include:</p> <ul style="list-style-type: none"> <li>- Update of the program for predisposal monitoring one year after its introduction on the basis of the monitoring results;</li> <li>- Update of the program for predisposal monitoring at the start of construction of a National disposal facility in order the specific activities related to construction to be reflected;</li> <li>- Update of the program for predisposal monitoring at the commissioning of the NDF in order the specific activities related to commissioning to be reflected;</li> <li>- Development of a monitoring program for the operational period of the repository based on the cumulative results of the pre-disposal monitoring;</li> <li>- Update of the program for monitoring during operation at each renewal of the license for operation based on an analysis of the accumulated results;</li> <li>- Development of a monitoring program for the closure period based on the analysis of the base of accumulated results and in accordance with the specific closure activities</li> </ul> <p>In the EIA Report is not written that the monitoring program will be updated as per requests of the mayors of any populated areas in Bulgaria so to have a double standard with respect to Bulgarian and Romanian mayors.</p> <p>In terms of sending newsletters with the results of radioecological monitoring of Kozloduy NPP to the mayors of neighboring municipalities on Bulgarian territory</p>
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		<p>(Kozloduy, Mizia and Oryahovo), this is a good practice to publish data and information to the public about the radiation situation in area. This is in line with Aarhus Convention on Access to Information and is a guarantee of the support of public confidence in the safe operation of NPP Kozloduy.</p> <p>Kozloduy NPP provides the same information, translated into Romanian, to the Romanian side, so there is a same attitude and there is no double standard for Bulgarian and Romanian side here also. Access to online information from the automated systems for radiation monitoring in 3 km zone of the NPP and the other stations of the national system RAMO-B are provided through the European radiological data exchange platform EURDEP, both for the Bulgarian and the Romanian population and other countries in Europe so there is a same attitude and no double standard for Bulgarian and Romanian side. SERAW will use the same approach during the operation of the NDF and there will be no double standard in relation to Bulgarian and Romanian side.</p>
<b>Request for information from Romanian responsible authorities - National Commission for Nuclear Activity Control</b>		
<b>10</b>	Transmission to the Romanian authorities of the assay results of European Commission on the implementation of Article 37 of the Euratom Treaty related to this project	In line with the requirements imposed by the Euratom Treaty, every member country of the European Union is obliged to prepare and send to the European Commission Report as per Article 37 of Euratom Treaty within range complying with Commission Recommendation of 11 October 2010 on the application of Article 37 of the Euratom Treaty. Bulgaria is obliged to prepare such report for the future National disposal facility on Radiana site in close proximity to KNPP in such way as the Romanian side is required to prepare such Report for the future repository on Saligny site near Cherna voda NPP. Assay results of European Commission are published in the Official Journal of the European Union, which is publicly available in English as well as in Bulgarian and Romanian languages.
<b>11</b>	Periodic transmission to the Romanian authorities of the monitoring program results, both before and after the commissioning	Bulgarian party has a policy of open and honest informing the population located near the NPP "Kozloduy" on the results of radiological monitoring of NPP "Kozloduy". This is done through newsletters, which contain summary information about main radiation parameters in the region – radiological gamma background, aerosol activity

	of the new repository	<p>of the air, status of the water of Danube River and basic foods tested. Newsletters are sent regularly to the mayors of the nearby populated municipalities. These newsletters, translated into Romanian, are sent regularly to the Romanian side. Access to online information from the automated systems for radiation monitoring in the 3 km zone of the NPP and the other stations of the national system RAMO-B are provided through the European radiological data exchange platform EURDEP to the Bulgarian and the Romanian population as well as to other countries in Europe. SERAW intends to follow the same policy of openness in the implementation of the National disposal facility. The form of disclosure of the results can be through regular newsletters and/ or publication of the main results on the website of SE RAW, as is the practice of some organizations for management of radioactive waste. Whichever way is chosen, the information will be equally accessible to the population of the Romania as Bulgaria treats the Bulgarian and Romanian population in the same way. The same information can be sent to the Romanian authorities.</p> <p>Concerning the similar programs of both countries - both are planning to build their disposal facilities by 2020. The designs of the disposal facilities are similar, both parties implement programs for predisposal monitoring, both parties in accordance with the safety standards of the IAEA and in fulfillment of the requirements of national legislations in the nuclear field are obliged to implement programs for monitor in the period of operation of the disposal facilities and in the period following their closure. Bulgaria insists on equivalent exchange of information between the two countries.</p>
<b>Request for information from Romanian responsible authorities - Ministry of Health</b>		
12	In the geographical given context, where in the area of influence of NPP Kozloduy in the 30 km perimeter are living 75,793 inhabitants in 18 rural villages in the territory of Dolj and Olt counties, we ask to further consider the cumulative impact on human	<p>In Chapter VI of the EIA Report the cumulative effect from the operation of the disposal facility with the other facilities on the site of Kozloduy NPP is analyzed in detail. The absence of cumulative effects and transboundary impact on Romanian territory is proven.</p> <p>In connection with the proof of absence of cumulative impact of the existing nuclear facilities, in the EIA Report is discussed the health status of the population of 30 km</p>

health of the proposed landfill radioactive and existing and future reactors.

area of the investment proposal in Bulgaria by indicators of mortality from diseases in whose genesis the radiation factor can prevail and includes the following groups of diseases: malignancies, diseases of the blood and blood-forming organs and congenital malformations, deformations and chromosomal aberrations.

Regarding the Romanian population living in the 30 km zone of impact of Kozloduy NPP according to Eurostat, the comparative analysis of data for mortality from cancer in the European Region for 2008-2010 shows that the Northwest region and Southwest Oltenia region are areas with lowest cancer mortality in Europe.

According to the data of the National Statistical Institutes of Romania and Bulgaria, the death rate from cancer per 100 000 people in the areas of Dolj and Olt in the last four years are lower than the national average and Vratsa region:

	2010	2011	2012	2013
Romania	211.2‰	215.5‰	219.0‰	222.4‰
Regions of Dolj and Olt	198.8‰	193.1‰	208.7‰	206.8‰
Vratsa region	304.3‰	307.7‰	296.0‰	320.0‰

For the period 2010-2013 in the regions of Dolj and Olt no evidence of deaths from diseases of the blood and blood-forming organs and the mortality from congenital malformations, deformations and chromosomal aberrations are respectively 2.00‰, 1.09‰, 2.12‰ and 1.96‰.

In conclusion, we can conclude that the health status of the population within 30 km zone around the investment proposal on the territory of Romania does not differ from the one of the entire population of the country. Mortality from cancer is lower than the one on Bulgarian territory and the average cancer mortality of the Republic of Romania. According to Eurostat data, it is one of the lowest in the European Region for the period 2008-2010.

As a whole, the leading cause of deaths in Dolj region, as well as in Vratsa region are cardiovascular diseases, suggesting that aging of the population, the lifestyle – non-healthy diet, overweight, bad habits (consumption of alcoholic beverages, smoking),

		<p>low physical activity, lack of exercise and stress are critical for the health status of the population.</p> <p>The results of official statistics show that so far there is no evidence of radiation impact on population health in the regions of Vratsa and Dolj from the present capacity of Kozloduy NPP, which in turn proves that even after the implementation of the investment proposal it is not expected cumulative transboundary risk for the population of the Republic of Romania.</p> <p>In addition, see the answer to question 7.</p>
<b>“Romanian Waters” National Administration</b>		
<b>13</b>	<p>Is maintaining its standpoint regarding the necessity to describe the ground waters and the Danube River’s qualitative monitoring system in the future disposal facility for radioactive waste area of influence.</p>	<p>In Section 3.2.2 of the EIA Report is included detailed information on the hydrogeological conditions and groundwater at the site of the NDF and the surrounding area and described the monitoring system of groundwater. The EIA Report contains also description of the monitoring of the Danube River.</p> <p>As stated above in the answer to question 1, such a monitoring system is mandatory for a disposal facility for radioactive waste in compliance with the safety standards of the International Atomic Energy Agency, in accordance with the requirements of the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management, the EU Directives and the requirements of the national legal framework.</p> <p>The system for monitoring of the quality of groundwater and Danube River water in the area of potential impact of the future national disposal facility is developed on the basis of detailed field and laboratory studies on Radiana site and its surroundings and includes:</p> <ul style="list-style-type: none"> <li>- Construction of 12 monitoring wells (piezometers) of the aquifer in the area of the disposal facility</li> </ul> <p>The monitoring wells, installed in close proximity to the location of future disposal cells obtain reliable information on the area of direct potential impact of the disposal facility. The control and monitoring system of groundwater</p>



		<p>includes reference monitoring wells (piezometers) located before the disposal cells for of radioactive waste, and control monitoring wells (piezometers), located after the repository cells in the direction of movement of groundwater flow and in close proximity to the boundary of the site. Each observation well is equipped with proper measuring devices which will allow automatic measurement of groundwater level, groundwater temperature and conductivity, storing and transference of the collected data; a bladder pump is permanently installed to allow consistent and high quality water sampling to be undertaken. During ground water sampling the <i>in-situ</i> parameters of the water (dissolved oxygen, electrical conductivity and pH) are measured and pumping continued until consistent values for these parameters are recorded, indicating the water being pumped was the formation ground water.</p> <ul style="list-style-type: none"> <li>- There are also monitoring wells constructed outside the zone of potential direct impact of the disposal facility, i.e outside the area for precautionary measures of the NDF, which is within the boundary of the Radiana site. These monitoring wells are located between the boundary of the repository and the Danube River and are constructed as a part of the monitoring program of the NPP "Kozloduy". NPP "Kozloduy" measures water levels and indicators of water quality in line with the legislation using 17 boreholes, and in 196 piezometers four times a year are taken samples to be analyzed for their radioactivity</li> <li>- The system for monitoring of the groundwater of SERAW provides information and control of the following parameters (characteristics) of groundwater flow—groundwater table seasonal fluctuation, flow rates and direction of groundwater flow, aquifer recharge and discharge characteristics, groundwater flow parameters (hydraulic heads and gradients, hydraulic conductivity and transmissivity), transport parameters (effective porosity, hydrodynamic dispersion, diffusion, retention/retardation).</li> <li>- A regular sampling of groundwater observation wells (piezometers) is performed. Sampling of groundwater from the monitoring wells installed at the NDF site is undertaken on a quarterly basis. The hydrogeochemical analyses</li> </ul>
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		<p>include determination of pH, dissolved oxygen, electrical conductivity, temperature, redox potential, major anions (Cl, HCO<sub>3</sub>, CO<sub>3</sub>, SO<sub>4</sub>, NO<sub>3</sub>) and major cations (Na, K, Ca, Mg, NH<sub>4</sub>), alkalinity, total organic compounds, alpha activity, beta activity, natural K40, total internal dose, tritium and other natural and artificial radionuclides, aggressive agents (Cl, SO<sub>4</sub>, pH);</p> <ul style="list-style-type: none"> <li>- The monitoring program of SERAW also includes the waters of the Danube River. As stated above in the answer to question 1, a regularly sampling of water, sediments and fish from the Danube River is performed, and they are controlled in terms of the content of radionuclides. The same is performed by the NPP "Kozloduy" within the program for radiological monitoring;</li> </ul> <p>Besides the measures for monitoring of the Danube River waters related to the investment proposal for the construction of the NDF, we must emphasize that Republic of Bulgaria has ratified the Danube River Protection Convention and is an active member in ICPDR Vienna. Plan for managing the entire international Danube River basin as well as Management Implement Plan for the Danube basin management are implemented, and presently the draft of the updated Management plan of the Danube basin (2016-2021) is published. The water quality in the Bulgarian section is monitored in 5 points for surveillance monitoring. Three of the stations fall into two monitoring networks – the national monitoring program for water, and TNMN of ICPDR/ Transnational Monitoring Network for the Danube River, and the other two - in the second (TNMN). In two of the points – at village Novo Selo and the town of Silistra a sampling and analysis of the Bulgarian bank of the river is done, as well as midstream and along Romanian bank of the river with the same frequency and duration.</p> <p>The indicative indices that are analyzed on the Danube, on stations of TNMN are unified and have a frequency of 12 times a year. According to the minimum requirements for the frequency of monitoring of the physicochemical indicators (Annex 5 of the WFD) in the Danube station, which are part of the national program, sampling and analyzes four times a year are carried out. In implementing activities</p>
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		<p>of project WATER for Integrated Water Management Danube between the Republic of Bulgaria and Romania were agreed monitoring points in the common section of the river, regulations and methods for analysis, indicators of quality monitoring and management for monitoring the Danube in all the elements of quality.</p> <p>For the river is implemented a control physico-chemical monitoring and operational monitoring by a special Program for national monitoring of basic physicochemical indicators, for priority and specific pollutants, and hydromorphological and biological quality elements, according to the program of ICPDR, which is included in the National system for control of the environment, performed by Executive Environment Agency and regional laboratories. Controlling and operational hydrobiological monitoring is also performed on the same program. For implementation of the monitoring program for Danube is in force Order № РД-182/26.02.2013 of the Minister of Environment and Waters. The monitoring of the Danube River is performed by the National Institut of Meteorology and Hydrology and the authorities of the Ministry of Health.</p> <p>In line with the requirements of Item 4 of Article 3 of the Water Framework Directive 2000/60/EU for Danube River such as transboundary water body, in the common section is mandatory joint coordination with Romania, and periodically meetings of Bulgarian-Romanian working group for basin management are held, last of which in May 2015 in Bucharest.</p> <p>All the information of the performed monitoring is subject of reporting in accordance with the requirements of the international competent institutions and is public.</p>
<p><b>Letter dated 16<sup>th</sup> September 2011: Romania’s point of view on the EIA documentation and on the document received from Bulgaria as response to public comments and the authorities in Romania for the Bulgarian project “Proposal for investment to build a National Disposal Facility for Low and Intermediate short-lived radioactive wastes” at Kozloduy”</b></p>		
14	I. Site location in relation to soil and	The remark was taken into consideration in developing the revised EIA report from

<p>water taking into account the close distance from Romanian border</p> <p>- There is a need to have clear and sound information on Radiana site characteristics in order to demonstrate that the repository will not allow any leakage of radionuclides and thus the potential impact on the population and environment will be below the level imposed by the Bulgarian nuclear regulatory body</p>	<p>2015. The Report presents clear and sound information on Radiana site characteristics, which includes detailed information on the latest research conducted at the site after preparation of the previous EIA report.</p> <p>Clear and sound information on the design characteristics of the future National Disposal facility is also included, including for the infiltration control network, which will function during the period of operation of the facility, as well as during its closure and after its closure – during the period of institutional control. With this information and the assessments of the EIA Report it is proven that there will be not any leakage of radionuclides and thus the potential impact on the population and environment will be below the level imposed by the Bulgarian nuclear regulatory body.</p> <p>Special attention must be paid to the information relating to the characteristics of the geological environment in Romania. New information by the Romanian Geological Institut ISPIP was obtained, thanks to which it was possible to develop a geological geomorphological profile in the 30 km zone around the Kozloduy NPP, which includes Radiana site. This single geological and geomorphological profile covers both Bulgarian and Romanian territory and is given in Annex II. From this profile it becomes clear that the aquifer formed in sandy sediments of Archar is confined, with general direction to the north-northeast. It is drained in the alluvium of the floodplain terrace T0. North of the Danube River same aquifer is accumulated in the sands of the Berbesti Formation, which is confined, with general direction to Danube River. The waters from the saturated sands of the Berbesti Formation are discharged into the River from elevation of 32 mm, and those of Archar Formation in the Bulgarian section are drained into the river alluvium of elevation 0 m. The formed fold arching "Gangiova-Dabuleni", with axis parallel to the river, is a physical barrier that does not allow water to mix the two bent. Their mixing is only in the river bed.</p> <p>The above facts prove the absence of possibility for transboundary pollution by groundwater as a result of possible migration of radionuclides to the waters of the</p>
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		<p>regional aquifer in Archar Formation and their switch to the analogue of the Archar Formation on Romanian territory - Berbesti Formation.</p> <p>In accordance with internationally widely accepted best practice, the ISAM Methodology developed for safety assessments of near-surface repositories for radioactive waste has been chosen for the post-closure safety analysis for the NDF in the framework of the ISAR (Intermediate Safety Assessment Report), whose results are given in the EIA Report from 2015.</p> <p>The long-term simulations for assessment of the radionuclide migration are carried out by the computer code GoldSim Simulation Environment extended by the Radionuclide Transport Module. The internationally accepted suitability of the GoldSim software is evident, confirmed by its development and use over a period of almost 25 years (see <a href="http://www.GoldSim.com">www.GoldSim.com</a>). GoldSim has been used by and for a diverse set of customers and clients, including government agencies in over ten countries (such as the US Department of Energy, NASA, the Nuclear Regulatory Commission), research laboratories (including Sandia National Laboratories, Los Alamos National Laboratory, the Paul Scherrer Institute, and Massachusetts Institute of Technology), and commercial organizations worldwide. It has become a standard code for repository calculations.</p> <p>The summarized results for the total annual dose for normal evolution farm scenario obtained by the GoldSim simulations show maximum dose of 0.87 <math>\mu\text{Sv}/\text{yr}</math> which is order of magnitude below the level imposed by the Bulgarian nuclear regulatory body 0.1 mSv/yr.</p>
15	<p>- At Radiana site the phreatic level is at a very low depth. The intersection depth of short-lived radionuclides at Radiana site is not scientifically based. A presentation of the radionuclides transport model through unsaturated zone results (dependence of</p>	<p>The NDF disposal cells are situated at elevation +55 m over loess-cement cushion with a thickness of 5 m. Ground water level (GWL) is situated at an elevation of +39-+42 m Thus the total thickness of the unsaturated zone is between 13-16 m(including 5 m loess-cement cushion). The analyses in the updated EIA Report and current ISAR are based on this thickness of unsaturated zone. The recent data (2013-2014) obtained within a pre-disposal hydrogeological monitoring project of</p>

	<p>radionuclides concentration from penetration depth), for different time periods, is needed</p>	<p>the Radiana site show that the GWL is situated even at lower levels.</p> <p>In the EIA Report are presented the results of the modelling of the migration of radionuclides (described in Sec. 14) in the unsaturated zone, as a result of which it is established that:</p> <ul style="list-style-type: none"> <li>- Radionuclides are retained within the disposal facility;</li> <li>- The maximum effective dose for the critical group of the population is orders of magnitude lower than the radiological criteria for maximum effective dose of 0.1 mSv per year.</li> </ul>
<p><b>16</b></p>	<p>- The unconfined (phreatic) aquifer formed in terrace deposits (T2) of the Danube is recharged by confined depth aquifer. The piezometric level of the phreatic aquifer is only one meter below the depth level of the repository. Special scenarios for simulating the variation of piezometric level for different recharge conditions should be developed</p>	<p>The NDF disposal cells are situated at much higher elevation (within transition zone between terraces T2 and T6) than this one of the terrace T2. The groundwaters in the deposits of terrace T2 are not present in the hydrogeological section of the site for the NDF. They are located north of it in the direction of the Danube River.</p> <p>As it is explained in the answer of the previous question 15, the thickness of the unsaturated zone is more than 13-16 m. The groundwater fluctuations measured in the period from August 2013 to now in the recently specially constructed observation wells along the southern and northern boundaries of Radiana site are within a range of up to 1.0 m. Thus the ground water fluctuations cannot cause inundation or even saturation of the vadose zone.</p> <p>Sources of possible external flooding for Radiana site may be maximum natural water levels of the Danube River. In this relation, the EIA Report reflects the results of simulating changes in water levels during floods. It was found that with the natural regime of the Danube River the predicted maximum natural water levels reach elevation +32.70 m. There is no risk of flooding, even at high intensity rainfall, as the site for the NDF is located above elevation +55 m (50 m + 5 m loess-cement cushion).</p> <p>Assessment of the flooding hazard historically based on geological-geomorphologic analysis proves that the terrain, on which the Radiana site is situated, has not been</p>

		<p>flooded by Danube River water during the last 186 000 years.</p> <p>Besides the study of the hazard of erosion on the right bank of the Danube River demonstrates categorically that such hazard for the Radiana site does not exist – the erosion activity of the Danube river on the second non-floodplain terrace T2 was ceased 71 000 years ago and there is no reason to expect that it will be resumed in the next several hundred years.</p>
<b>17</b>	<p>II. The proposed project of NRRAW provides, according to IAEA Principles, defense in “depth” against release of radionuclides by the seven engineering and natural barriers of NRRAW so if one barrier doesn’t fulfill its function, the other barriers will contain the radionuclides. However, we believe that NRRAW modules (which represent one of the engineered barriers) are very large (117m long, 35.5m wide and 10m height), which may lead to cracks in the base plate, even of it has thickness of 1000 mm (considering the experience of radioactive waste repository at Drigg in UK)</p>	<p>The NDF consists of 66 disposal cells for disposal of waste packages, placed on 3 equal platforms at one level, each of them consisting of 22 cells. Cells are rectangular monolithic reinforced concrete structures whose dimensions are 20.15m length, 17.05m width and 9.45m height. They are designed as structurally independent, without constructive connection with each other.</p> <p>In the Technical design of the NDF prepared by Westinghouse, DBE Technology, Enresa, EQE Bulgaria AD are carried out extensive 2D (by ANSYS 11.0) and 3D (by SAP2000 program package) finite element analyses of the stability and integrity of the disposal cells under different combinations of static and dynamic loads. The microcracking of the reinforced concrete disposal cells is limited to an extent that do not impairs the proper functioning and durability of the structure or cause its appearance to be un acceptable. The calculated cracks width are limited to certain value (0.15 mm) which is satisfactory for reinforced concrete structures with respect to IAEA-TEC DOC 1255, NEA/CSNI/R(2002)7/VOL2, EuroCode EN 1992-1, American Nuclear Code ACI-349, American Code ACI-318, German Code DIN 1045, Spanish Code EHE-08.</p>
<b>18</b>	<p>NRRAW is built in the trenches and has room walls (with thickness of 500 mm) below ground level. We believe that the waterproofing walls in the NRRAW modules must provide impermeability for a very long period until 2390 (considering the</p>	<p>The question is discussed in great detail in the updated EIA Report from 2015. The National disposal facility for low and intermediate level radioactive waste shall provide safe isolation of the radioactive waste from the environment and biosphere of human for a period of operation of the disposal facility, during its closure and institutional control after its closure. Measures for that are taken by the appropriate characteristics of the site, which is selected after a site selection procedure in accordance with the requirements of the national legal framework and</p>

<p>experience of La Manche repository in France).</p>	<p>safety standards of the International Atomic Energy Agency and through appropriate design of the repository. As described in the EIA report, isolation for a long period of time (60 years operation and 300 years period of institutional control) is based not only on the integrity of the walls of the repository, but on multiple barriers because the NDF is a multi barrier near-surface engineering facility. As described in the EIA Report the elements of a multi-barrier system are the following:</p> <ul style="list-style-type: none"> <li>➤ <b>The first engineered barrier</b> is the waste form itself, which is cemented radioactive waste, some of which are preliminary put into steel drums with or without super compression. The safety function of the waste form (cement matrix in which the wastes are affixed) is related to the affixing of the radionuclides into the solid phase of the matrix as well as their retention by adsorption and precipitation in the alkaline media of the cement. In terms of Radiana site, the mechanism of degradation of the first barrier is carbonation that is a slow process and determines time resistance of the first barrier of thousands of years. The cement matrix serves also as a chemical barrier which does not lose its safety functions for thousand years.</li> <li>➤ <b>The second engineered barrier</b> is a hydroisolated reinforced concrete container with thick walls, bottom slab and a lid in which the waste is placed with the remaining void space being filled with mortar forming a monolithic form. Concrete container shall allow for the retrieval of waste in the period until the final closure of the NDF, which means that throughout the period of operation the container shall preserve its functional feature for transport and technological operations, including undistorted metal clamps (bearing ears) that are coated with corrosion-resistant coating. According to the Technical design of reinforced concrete container life-time span of reinforced concrete containers for disposal (functions of isolation and retention) is calculated for the period of disposal of 300 years. In terms of site Radiana the mechanism of degradation of the reinforced concrete container is carbonation that is a slow process and determines time</li> </ul>
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		<p>resistance of considerably longer than 300 years. Reinforced concrete container retains its functions as a chemical barrier for thousands of years. The container is licensed by the Nuclear Regulatory Agency and is made applying of very strict testing program in accordance with the terms of the license issued by the BNRA and safety standards of the International Atomic Energy Agency.</p> <ul style="list-style-type: none"> <li>➤ <b>The third engineered barrier</b> of the disposal facility consists of the hydroisolated disposal cells (DC) made of reinforced concrete, their foundation and closure slabs and the filling material. The safety function assigned to the DC is the retention of potential radionuclide releases from the waste packages by maintaining the cell integrity during the operation of the repository that lasts 60 years, during the repository closure, that lasts 15 years and during the whole period of institutional control, that lasts 300 years. According to the Technical design of the NDF, the design life-time span of the structure of the repository is 375 years. Concrete keeps its functions as a chemical barrier for thousands of years.</li> <li>➤ <b>The fourth engineered barrier</b> consists of a massive loess-cement cushion with thickness of 5m on which base the repository is constructed and the multilayer cover. Besides being a barrier against radionuclide migration, the loess cement cushion increases the thickness of the unsaturated zone and improves the overall ground conditions. The multi-layer protective cover is constructed using natural materials as clay, sand, and gravel etc., and has a construction which ensures a lot of important safety functions, most important of which are: <ul style="list-style-type: none"> <li>○ Minimize the infiltration flow of rain waters through the disposal system ensuring infiltration hydraulic flow below <math>1.5 \text{ L/m}^2</math> per year through the repository modules.</li> <li>○ Serve as a barrier against external distortion of the barrier system by humans, animals or plants;</li> <li>○ Provide protection against long-term erosion agents such as rainfall and</li> </ul> </li> </ul>
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		<p>wind</p> <p>➤ <b>The fifth (natural) barrier</b> is provided by the favourable site characteristics</p> <p>As seen from the above, the isolation of radioactive waste from the environment and biosphere of human is based not only on the isolating characteristics of hydroinsulated walls, bottom slab and roof slab of the repository, which themselves are able to isolate the waste for 375 years, but the isolation characteristics of the remaining elements of a multi-barrier protection system.</p>
<p><b>19</b></p>	<p>In accordance with the best practice, fiber-reinforced concrete containers with guaranteed durability of 300 years are currently being used for final disposal. Because the use of classical reinforced concrete containers is provided at NRRAW it is necessary to demonstrate an equivalent sustainability of these containers</p>	<p>Fiber concrete containers are a relatively new class of materials that are recently put into practice and their application is very limited for the purposes of disposal of radioactive waste. Due to the relatively recent implementation, there are no internationally accepted standards for the production of fiber concrete and no long-term observations on the state of fiber containers with radioactive waste in a surface repositories for disposal of low and intermediate level radioactive waste. Pursuant to the requirements of the national legal framework - Act on Safe Use of Nuclear Energy, for the management of the radioactive waste, including disposal in a repository for low and intermediate level waste category 2a, should be used technologies that are probated in practice and have proven their reliability.</p> <p>As stated above in the Answer to question 18, and as discussed in the EIA Report from 2015, the reinforced concrete container is the second barrier of a multi-barrier system to isolate radioactive waste from the environment and human biosphere. The reinforced concrete container is described in detail in the EIA report. It is characterized by thick concrete waterproofed walls, bottom plate and cover, external dimensions 1.95x1.95x1,95 m, net volume of 5 m<sup>3</sup> and maximum weight of the filled container 20 tons. The container provides biological protection so that the equivalent dose of gamma radiation from radioactive waste does not exceed 2 mSv/h at any point on the outer surface and 0.1 mSv/h at 1 m distance from the surface. In addition to storage and disposal of radioactive waste, the reinforced concrete container is designed for the transport of radioactive waste category 2a.</p> <p>According to the Technical design of reinforced concrete container, the life-time</p>

		<p>span (resource) of reinforced concrete containers for disposal (functions of isolation and retention) is calculated for the period of disposal of 300 years. In terms of site Radiana the mechanism of degradation of the concrete container is carbonation that is a slow process and time determined resistance considerably longer than 300 years. Reinforced concrete container retains its functions as a chemical barrier for thousands of years.</p> <p>The container is licensed by the Nuclear Regulatory Agency and is produced by applying of very strict testing program in accordance with the terms of the license issued by the BNRA and safety standards of the International Atomic Energy Agency. It includes tests for water impermeability; tests simulating freefall of filled container; tests for drilling, in which on the upper surface of the container is dropped a steel rod; pressure test in which the container is subjected to a pressure greater than five times its own weight; three types of tests for mechanical failure: (1) mechanical strength of container falling on a foundation from 6 m height; (2) mechanical strength of falling container on a vertical steel rod from 1 m height; (3) mechanical strength when throwing a steel plate with a mass of 500kg on the container; tests for fire resistance (30 minutes in burning hydrocarbon fuel at 800°C); tests for radiation protection, which are described in the EIA Report.</p> <p>In addition to the above, we have to add that longstanding observation of concrete containers manufactured in specialized division "RAW Kozloduy", filled with radioactive waste shows their resistance and absence of disruption on their external surfaces.</p> <p>In addition to the above, we have to refer to the international experience and the documents of the International Atomic Energy Agency, which has proven the feasibility of reinforced concrete containers for radioactive waste disposal in near-surface repositories.</p>
20	<p>III. Resistance to earthquakes</p> <p>- The Bulgarian legislation for the</p>	<p>The Technical design of the NDF, prepared by the Consortium Westinghouse (Spain), DBE Technology (Germany), Enresa (Spain), EQE (Bulgaria), is fully implemented in accordance with the requirements of the IAEA, Eurocode 7, Eurocode 8.</p>

	<p>nuclear/radiological and civil buildings has to reflect/ be compatible/ consistent with IAEA guidelines, namely Eurocode 8, and the site seismic data needed to assess seismic hazard on site and classify seismic/earthquake resistance of buildings are updated/reviewed in accordance with requirements applicable to current guidance (IAEA, Eurocode 8)</p>	<p>Specifically Eurocode 8 is transposed to the Bulgarian legislation through the BSEN 1998-1/ NA. Eurocode 8: Design of structures for earthquake resistance. Part 1: General rules, seismic rules for buildings. National Application(NA).</p>
<p><b>21</b></p>	<p>IV. Nuclear Safety</p> <ul style="list-style-type: none"> <li>- Safety Assessment Reports should be drafted and sent for analysis to Romania, and bilateral consultations should be considered after drafting these Reports</li> </ul>	<p>This text includes answers to questions 21, 23 and 24.</p> <p>According to the safety standards of the International Atomic Energy Agency, the requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Act on the safe use of nuclear energy and related regulations, SERAW is obliged to develop Safety assessment reports for NDF. As described in the updated EIA report, 2015. This includes:</p> <ul style="list-style-type: none"> <li>- Preliminary safety assessment report, which is being developed at the stage of site selection for the NDF;</li> <li>- Intermediate safety assessment report, which is being developed at the design stage of the NDF (development of Technical design);</li> <li>- Final safety assessment report, which is being developed at the stage of issuing a license for the operation of the NDF, which is a follow-up procedure after the issuance of the EIA decision;</li> <li>- An updated safety assessment report, which is being developed at each renewal of the operating license (according to Bulgarian legislation operating license shall be issued for a maximum period of 10 years);</li> <li>- Safety assessment report, which is to be developed on the stage of closure of</li> </ul>

		<p>the NDF</p> <p>Safety assessment reports include analysis of safety during the operation of the NDF, analysis of emergency situations and post-closure safety assessment (long terms safety assessment) and take into account the radiological consequences both for the staff that serves the NDF and the population. Safety assessment reports are part of the documentation that is analyzed in detail and is assessed by the competent authority - the Nuclear Regulatory Agency as part of the procedures of issuing permits and licenses.</p> <p>The requirements of the Romanian party on delivering the results of the Preliminary Safety Assessment Report and Intermediate Safety Assessment Report Safety Assessment Report are taken into consideration in the EIA Report from 2015. The methodologies for making preliminary and interim safety assessments are also presented. The Preliminary safety analysis is presented in detail in Chapter 1 in Part Comparative analysis of potential sites in terms of radiological safety criteria. The results show that the maximum effective dose to critical group members of the population is orders of magnitude lower than the regulatory limit of 0.1 mSv/a, introduced by the legislator in the Regulation on the Safety Management of Radioactive Waste. The Interim safety analysis is presented in Chapter 5 of the EIA report. The results for the personnel of the NDF and the population are presented. For normal-evolution scenario is shown that the maximum annual effective dose to critical group members of the population is 0.803 <math>\mu</math>Sv/a and is significantly lower than the aforementioned radiological criteria (1000 <math>\mu</math>Sv/a). Alternative scenarios related to future climate change, where the maximum annual effective dose to critical group members of the population is estimated at 0.900 <math>\mu</math>Sv/a are also examined. Design and beyond design basis accidents are examined and it is estimated that even with BDBA maximum annual effective dose for the closest living inhabitants, situated at a distance of 2.5 kilometers from the site Radiana, is 0.0246 mSv i.e radiological consequences are limited only within the site. This is because SERAW explicitly requested by the designer of the NDF - international Consortium of</p>
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	<p>Westinghouse Electric, Spain, DBE Technology, Germany, Enresa, Spain and EQE Bulgaria to develop the design of the repository so that the precautionary action zone to be within the boundary of the Radiana site. The estimated maximum annual effective dose is significantly lower not only than the maximum individual effective dose for the population under design basis accident (1 mSv/ a), but also than the maximum individual effective dose for the population in normal operation of the repository during the operation after its closure (0.1 mSv/a). This means that both the Bulgarian population, living closest to the repository and the Romanian population that lives at a greater distance, is not subjected to radiation exposure during design and beyond design basis accidents in the NDF.</p> <p>Information concerning safety analysis reports is published in national reports on the implementation of the obligations of the Republic of Bulgaria on the Joint Convention on the Safe Management of Spent Fuel and on the Safe Management of Radioactive Waste, which are publicly available on the website of the Agency for Nuclear regulation in Bulgarian and English languages.</p> <p>Especially for the exchange of information between experts and responsible institutions who develop/construct or operate repositories for disposal of low and intermediate level waste as well as governing bodies carrying out control of such repositories, the International Atomic Energy Agency has created the International Low Level Waste Disposal Network (DISPONET). SERAW presents the specialized aspects of safety assessments on this forum where representatives of the Romanian party are taking part.</p> <p>Safety assessment reports are part of licensing procedures in the nuclear legislation in accordance with the Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy. They are reviewed and evaluated by a specialized authority – BNRA, and are not subject to external distribution in their full scope.</p> <p>As stated above, the methodology and results of the preliminary and intermediate safety assessments are given in the EIA Report, but the final safety assessment report is approved in a different than EIA procedure which is following and is carried</p>
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		<p>out by another administrative authority. It is convincingly demonstrated that the operation of the repository does not lead to negative radiological consequences to the environment and the population, so there is no basis of Romanian party for such requests.</p>
<p><b>22</b></p>	<p>- To remove uncertainties about the long lived radioactive waste disposal from Novi Han (which may exist in intermediate storage in Novi Han), we require to the Bulgarian party to transmit the revised inventory of waste resulting from radioactive waste characterization</p>	<p>The final inventory is presented in EIA Report from 2015.</p> <p>Information on inventory of the waste is part of the information that each IAEA member state is required to report pursuant to its obligations under the Joint Convention on the Safety of Nuclear Fuel Management and on the Safety of Radioactive Waste Management. National reports of the Republic of Bulgaria are publicly available in Bulgarian and English on the website of the Nuclear Regulatory Agency.</p> <p>Inventory of the repository is publicly available and in the new Strategy for management of spent nuclear fuel and radioactive waste until 2030, which was developed in fulfillment of the obligations of the Republic of Bulgaria under Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. This strategy has been sent to the European Commission and publicly available on the website of the Ministry of Energy.</p> <p>Regarding the doubts expressed by the Romanian party that in the national disposal facility will be disposed long-lived radioactive waste from Novi Han (which may exist in intermediate storage in Novi Han), it should be emphasized, as described in the EIA report that in the NDF will be disposed only low and intermediate level short-lived waste category 2a according to Bulgarian Ordinance on the Safe Management of Radioactive Waste. NDF is designed only for such type of waste. The long-lived radioactive waste from Novi Han does not meet the waste acceptance criteria at the NDF and can not be disposed there. Last but not least it should be emphasized that the disposal of radioactive waste in the NDF is subject to licensing by the Nuclear Regulatory Agency, both through the issuance of permits and licenses, and by monitoring and inspections on site for compliance with the conditions of permits</p>

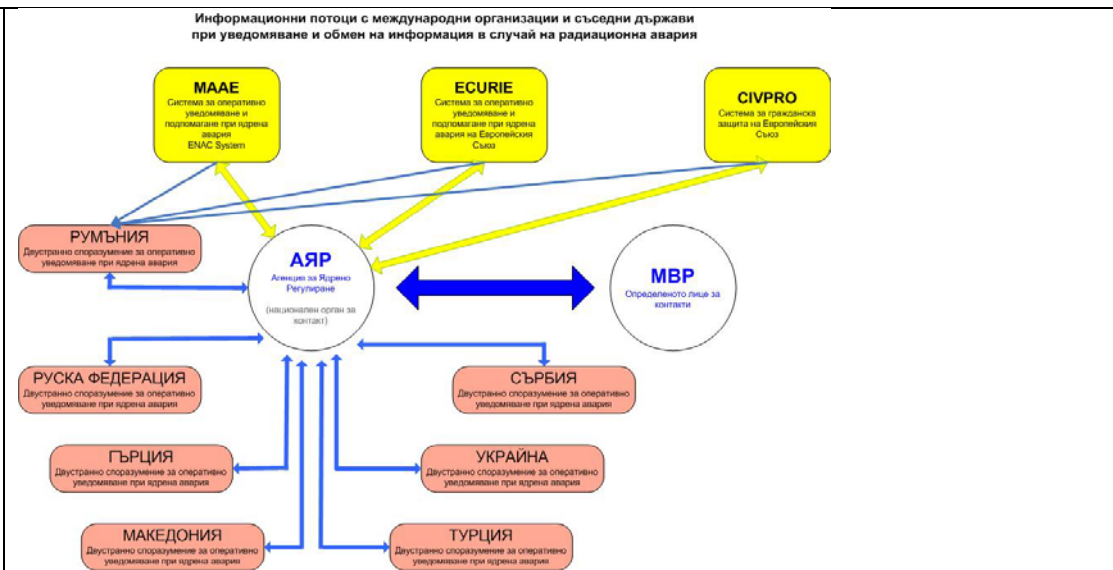
		and licenses.
<b>23</b>	<p>V. Impact subsequent to closure</p> <p>- According to the response at paragraph 75 of the document mentioned as response to SITON comments, it appears that the preliminary assessment report was prepared for the NRRAW Safety Repository. As the Romanian side has no access to such documentation. We believe that the information in this report, which may clarify some of the questions raised by Romanian side, should become available for information</p>	See answer to question 21.
<b>24</b>	<p>- Radiological safety assessment must be elaborated on long term and has to include all possible accidents impacting Romanian population. The estimated doses must confirm the stated dose limits. The EIA report should assess the consequences of possible accidents both in operation and post closure phase</p>	See answer to question 21.
<b>25</b>	<p>VI. Emergency situation</p> <p>A special plan for dealing with emergency situations together with</p>	In the Bulgarian legislation are strictly regulated the activities of the state institutions in case of a nuclear and radiation accident with possible impact on the territory of other countries, more specifically Romania, and also the process of notification, procedures for information stream and periodic submission of further



<p>the Romanian authority the site status and evolution needs to be developed. Such plan should include:</p> <ul style="list-style-type: none"> <li>-The creation of a direct communication line between local Bulgarian and Romanian authorities in order to inform in real time about the site status and evolution, in case of unpredicted radiological event</li> <li>-Special unique notification messages for emergency situations</li> <li>-Periodical bilateral drills between emergency authorities in order to test the time response of the communication line in case of accidents</li> <li>-The emergency plan including the mandatory measures in case of heavy precipitation, earthquake, plane crash, terrorist attacks etc.</li> </ul>	<p>information.</p> <p>Bulgaria has signed and implements the international conventions as well as EU requirements that are mandatory for each Member State:</p> <ul style="list-style-type: none"> <li>- Convention on Early Notification of a Nuclear Accident ratified by Decree№3514of the State Council of 30.12.1987;</li> <li>- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency ratified by Decree№3514of the State Councilof30.12.1987;</li> <li>- Decision No.1313/2013/EU of the European Parliament of the Council of 17 December 2013 on a Union Civil Protection Mechanism</li> <li>- Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection</li> </ul> <p>National legal framework is established including:</p> <ul style="list-style-type: none"> <li>- Law on Disaster protection and its regulations;</li> <li>- Act on the Safe Use of Nuclear Energy;</li> <li>- Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies;</li> <li>- Regulation of the conditions and procedure for notification of the Nuclear Regulatory Agency about events in nuclear facilities and sites with sources of ionizing radiation</li> </ul> <p>Between the Government of the Republic of Bulgaria and the Government of Republic of Romania is concluded an Agreement on Early Notification of a Nuclear Accident and the exchange of information on nuclear facilities, effective from January 1-st, 1998.</p> <p>State structures are created, information for which is publicly available. Effective is the National Plan for Disaster Protection, which is also publicly accessible, that describes the actions of public institutions, measures to protect the population and</p>
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	<p>informing on a national and international level.</p> <p>The procedure regulating the stream of information that takes place in the event of a nuclear or radiological accident with possible impact on Romanian territory is summarized in the following:</p> <p>BNRA, as the regulatory authority, has specific obligations that can be summarized as follows:</p> <ul style="list-style-type: none"> <li>• Performs the functions of a central authority and a point of contact for notification of an accident and providing assistance under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency;</li> <li>• Provides information to other countries and international organizations, including notification systems EC-ECURIE (system of the European Union for operational Notification and Assistance in case of Nuclear Accident) and IAEA-USIE (IAEA Unified system for exchange of information on accidents);</li> <li>• In case of accident notifies and provides information to other countries and international organizations, neighbouring countries and countries that may be affected through contact groups of the countries. This also applies for direct notification of the National Commission for Nuclear Activities Control (CNCAN) of Romania</li> <li>• Collects and processes incoming data which characterizes the accident, prepares forecasts for its development and the consequences for the population and transmits the results to the National Headquarters for coordination and control of the Council of Ministers and other countries.</li> </ul> <p>In case of emergency, the information BNRA provides to the international organizations, depending on the situation and possibilities and if it does not compromise national security, contains the following data:</p> <ul style="list-style-type: none"> <li>• Time and place of the accident event;</li> <li>• Presumable or defined cause for the accident and a forecast of its progress</li> </ul>
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		<p>in the event of a radioactive release into the environment;</p> <ul style="list-style-type: none"> <li>• General characteristics of the released radioactive substances, including the possible physical or chemical form, actual quantity, composition and other characteristics of the releases;</li> <li>• Information on meteorological and hydrological conditions and forecasts;</li> <li>• The results of radiological monitoring and analysis of food and drinking water;</li> <li>• Undertaken or planned measures to protect and notify the population;</li> <li>• Forecasts for the spread of the radioactive substances released into the environment and their deposition.</li> </ul> <p>The deadline for notification of neighboring countries is also regulated. It is up to two hours after the time of accident occurrence. Information between Bulgaria and Romania is exchanged via different channels (see Figure 1):</p> <ul style="list-style-type: none"> <li>• From BNRA to CNCAN (National Commission for Nuclear Activities Control);</li> <li>• From BNRA to IAEA (via USIE) and CNCAN;</li> <li>• From BNRA to European Commission (via WebECURIE) and Ministry of internal affairs of Romania;</li> <li>• From Ministry of internal affairs of Bulgaria to the Ministry of internal affairs of Romania;</li> <li>• From Ministry of internal affairs of Bulgaria to the EU Commission body for civil protection and the Ministry of internal affairs of Romania;</li> <li>• From Ministry of internal affairs of Bulgaria to the From Ministry of external affairs of Romania;</li> </ul>
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*Figure 1: Information stream from Bulgaria to Romania in case of nuclear or radiation accident*

As seen from the above, the two countries Bulgaria and Romania have created relationships that govern actions in the event of a nuclear or radiological accident. This includes both the requested by the Romanian side direct communication lines, Special unique notification messages for emergency situations, as well as periodical trainings, which are not only bilateral between Romania and Bulgaria, but also international.

On the request by the Romanian side to elaborate an emergency plan it shall again be emphasized that the emergency plan is binding under international standards and national regulations. Emergency plan is elaborated on the next stage of the investment proposal—on stage of commissioning. According to the Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy, the application for NDF commissioning permitis accompanied, among the other

		<p>documents, from emergency plan. Requirements for emergency plans are defined in Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies and include those required by the Romanian party mandatory measures in case of heavy precipitation, earthquake, plane crash, terrorist attacks etc.</p> <p>We have to emphasize, as described in the EIA that particularly for NDF SE RAW requested by the designer of the facility to develop the design of the national repository in such a way that the precautionary action zone to be within the boundary of the repository. This means that even if in case of BDBA(beyond design basis accident), radiological consequences are limited only within the site. As described in the ADI Report, the maximum individual dose for each person of the nearby populated area, which is located at a distance of 2.5 kilometers from Radiana site, is 0.0246 mSv. This is significantly lower not only than the maximum individual effective dose for the population under design basis accident (1 mSv/a) but the maximum individual effective dose for the population in normal operation of the repository and after its closure (0.1 mSv/a). This means that both the Bulgarian population living closest to the repository and the Romanian population that lives at a larger distance is not exposed to radiation in case of design and beyond design basis accidents in the NDF.</p>
26	<p>VII. Monitoring</p> <p>A continuous post-project analysis in accordance with art.7 of the Espoo Convention, is required by Romania. Project monitoring is essential for verifying the effectiveness of measures taken to reduce environmental impact. EIA report should include a monitoring scheme:</p>	<p>Bulgaria agrees in principle to such an approach, but in the case of a proven by Romania need of such analysis, additionally to the proposed and performed monitoring.</p> <p>Effectiveness of measures to reduce the impact on the environment is proved by the implementation of a program for radiological monitoring of environmental components (air, ground and surface waters, incl. Danube water, soil, vegetation, agricultural products and fish from the Danube ) in the monitored zone of NDF. As stated repeatedly in the answers to these questions, and as described in the EIA report, this is a long-term program, which will continue throughout the life cycle of the repository, although, based on a multi-barrier protection of the repository, in</p>

	<p>indicators, frequency, reporting format and content of public report</p>	<p>the EIA report and in the ISAR it is proven the lack of radioactive emissions into the environment. Submission of summarized results to the Romanian party will be in line with already established practice of NPP "Kozloduy" (KNPP), which sends the summarized results of radioecological monitoring of NPP "Kozloduy" to the Romanian party. It is also provided continuous on-line access to information from the automated radiation monitoring in 3 km zone of the KNPP and the other stations of the national system RAMO-B platform in the European Radiological Data Exchange EURODEP.</p>
<p><b>27</b></p>	<p>-We ask for results of the monitoring process in order to comply with the Habitat and Birds Directives, taking into account that on the Romanian border we have some Natura 2000 sites designated</p>	<p>Monitoring programs of the repository are of the Ministry of Environment and Waters competence.</p> <p>Construction and operation of the NDF do not affect areas protected under the Habitats Directive and the Birds Directive neither on the territory of the Republic of Bulgaria nor on the territory of Romania. The conclusions of the assessments in the EIA report and ADI report are that there is a lack of any negative impact, including transboundary, in terms of components and factors of the environment, humans and Natura 2000.</p> <p>As stated above in the answer to question 26, the effectiveness of measures to reduce environmental impact, including reducing the impact on protected areas is proved by the implementation of a long-term program for radiological monitoring. The program for radiological monitoring of the repository covers the components of environment (air, ground and surface waters, incl. Danube River water, soil, vegetation, agricultural products and fish from the Danube in the monitored zone of the NDF. As stated repeatedly in the answers to these questions, and as described in the EIA Report, this is a long-term program, which will continue throughout the life cycle of the repository.</p> <p>Submission of summarized results to the Romanian party will be in line with already established practice of NPP "Kozloduy"(KNPP), which sends the summarized results of radioecological monitoring of NPP "Kozloduy" to the Romanian party. It is also provided continuous on-line access to information from the automated radiation</p>

		monitoring in 3 km zone of the KNPP and the other stations of the national system RAMO-B platform in the European Radiological Data Exchange EURODEP.
<b>28</b>	- The results of hydrological monitoring process (monitoring of flowing direction, the chemical and radiochemical status of water) should be transmitted to the Romanian party	<p>The question was set up in 2011 and taken into account in the elaboration of EIA report. In the updated EIA Report from 2015 are described the conducted geological, hydrogeological and hydrological research, including pre-disposal monitoring of groundwater and vadose zone, the results of these studies and monitoring are given. Information is given also in the current document in the answers to questions 1 and 13.</p> <p>Regarding the future submission of the results of the pre-disposal monitoring of the Romanian party, see answer to question 11. Bulgaria will provide a summary to the Romanian party in the form of newsletters and/or posted on the website of the SE RAW. On-line information systems for continuous radiation monitoring is available in EURODEP.</p> <p>Once again we want to emphasize that programs for the construction of a repository in both countries Bulgaria and Romania are very similar. Both countries plan to build a repository by 2020. Both countries plan to build one and the same type of repository. Both countries conduct programs for pre-disposal hydrogeological monitoring. Bulgaria has entered into an EIA procedure, while Romania plans to do so and to notify the Bulgarian side in accordance with the requirements of the Convention on Environmental Impact Assessment in a Transboundary Context. This similarity of the programs, and the Agreement on exchange of information between competent authorities on both sides - Bulgarian Nuclear Regulatory Agency (BNRA) and the National Commission for Nuclear Activities Control (CNCAN) of Romania, requires equivalent information exchange.</p> <p>Bulgaria insists that this information exchange to be carried out under the agreement for the exchange of information between the competent authorities of both countries and to include not only the transmission to the Romanian party of the results of the pre-disposal hydrogeological monitoring around future national repository, but to receipt from the Romanian party the results of pre-disposal</p>

		hydrogeological monitoring conducted on Saligny site, close to Cerna voda NPP.
<b>29</b>	-We require the waste inventory of the repository together with the monitoring results	See answer to question 22 regarding the inventory of the NDF. See answer to question 26 regarding the monitoring results.
<b>30</b>	VIII. Conclusions  - We do not dispute the quality of the specialists who prepared this report, nor the technical and scientific level of the people who have checked in details this material otherwise compulsory within the International and European norms and prescriptions. But it is impossible to accept that, all nuclear and/or radiological safety design features, in terms of objectives, essential functions, principles and requirements that led to the technical project certified by the Bulgarian Regulatory Authority are not at least formally outlined, suggested or performed. Not to mention the safety design criteria which were not, do not contain, nor will they be subject to any particular secret as long as nuclear safety philosophy and its instrument of investigation, the safety culture are still crucial in	Remark is taken into account in elaboration of the updated EIA Report from 2015.  In it the team of experts has assessed taking into account all further developed projects' reports, studies, requirements in normative documents of the EBRD, ICRP Conventions, safety standards of the IAEA, EU directives, the Bulgarian laws, regulations and government standards, review statements of competent institutions and results from the multiple methods used to forecast the impact on the environment components and conducted public hearings



	supporting nuclear activities.	
<b>31</b>	- Impact assessment report for the investment “Construction of low and intermediate National Repository for Radioactive waste disposal” does not have information on description of the forecasting methods used to assess the effects on the environment	Remark is taken into account in elaboration of the updated EIA Report from 2015. Methods for the assessment and list of the used literature, projects, studies, scientific researches and others are pointed out in the EIA Report in a separate section VIII and in ADI Report prepared in 2015, and are described in Sections III and IV of the EIA report in characterization of the relevant components of the environment and the impact on them in non-radiation and radiation aspects.
<b>32</b>	- In particular, the responses of the Bulgarian side cannot be accepted as satisfactory, as long as it recognizes that a preliminary report of safety assessment for NRRAW repository has already been prepared, a document which cannot be elaborated in any country in the world in the absence of a technical project for future installations, conceptual or detailed, but certified by competent authorities. Such a report represents a set of formal statements, referential, concerning at least: the design, authorization, the methodology to approach nuclear/radiological safety, detailed features regarding	Although the basic principles on which the investment process is carried out in member states of the European Union are similar, there are specifics in each country, which are prescribed by laws and regulations governing the process. Specifically for Bulgaria the investment process defined by the Spatial Development Act and regulations and bound by the Act on the Safe Use of Nuclear Energy and its regulations, runs as follows: (1) feasibility studies, where the procedure for site selection is carried out according to the requirements of the BNRA and preparation of a preliminary conceptual design; (2) elaboration of a conceptual design with options; (3) elaboration of technical design based on the selected option of conceptual design. Bulgarian Nuclear Regulatory Agency (BNRA) approves the selected site on the basis of a report on preliminary safety analysis and approved the technical design based on the ISAR (Intermediate safety analysis report), as this can be done through two separate approval procedures or together in one approval procedure. Ministry of Regional Development and Public Works approves the investment project on the basis of which construction permit is applied for. In the case of the NDF that is the technical design of the repository. Report, which refers the Romanian party, is not elaborated as a separate document in Bulgaria.  In the revised EIA Report, 2015 is provided the requested by the Romanian party information as to the characteristics of the site and the procedure for site selection

	<p>the site characterization/alternatives and specific requirements, postulated accidents, the source term. Such report should have been made available to the Romanian side</p>	<p>including also the characteristics of the alternative sites, which have been extensively studied of the sub-phase - site characterization stage of the site selection procedure, and in terms of the design of the repository, based on the technical design developed in respect of licensing procedures and authorization, with respect to approach for ensuring nuclear/radiation safety, in terms of methodology and results of safety assessments.</p>
<p><b>33</b></p>	<p>- A health impact assessment study on human health for the Romanian residents within the 30 km influence area in normal operation conditions as well as in each emergency situation, taking into account the continuous operation of the objective and cumulative impact with the NPP Kozloduy. The study should be further elaborated and transmitted during the next development stages</p>	<p>All aspects of environmental impact, cumulative effects and trans-boundary impact, including the impact on the health of residents in 30km area are detailed in the EIA Report and ADI Report of 2015.</p> <p>European health indicators of the impact of the environment on humans are: air quality, noise level, residential environment, including at home, traffic-related accidents, quality of drinking-household water, accidents with chemicals, radiation. Information on the current state of the existing nuclear facilities in the moment and the proven absence of radiation risk to the population during the normal operation of the NDF, because the expected radiation exposure will not exceed the natural background of about 0.1 <math>\mu\text{Sv/h}</math>, determine the health risk connected with the operation of the investment proposal on the population from the nearest residential area (the town of Kozloduy) and village Harlets, as negligible, in other words – zero. All this gives basis to assume that the operation of the NDF will have no negative impact on the population within the 30km zone around the NPP"Kozloduy" in Bulgaria and Romania. A cumulative effect in the area around the IP (investment proposal) is not expected and therefore it can not be expected in a transboundary aspect.</p> <p>A more detailed answer to the emergency planning and preparedness is provided in point 25.</p> <p>Design basis accidents are discussed in Item. 5.3.1.1. of EIA Report. The quoted values of doses are from the analyzes made in the Intermediate Safety Assessment Report of the NDF (ISAR). In the elaborated ISAR are examined and analyzed the consequences of accidents, taking into consideration the characteristics of the RAW</p>

	<p>package and specificity of certain activities to be carried out during the operation.</p> <p>Two scenarios are addressed in accordance with the international methodology:</p> <ol style="list-style-type: none"> <li>1. Drop of container</li> <li>2. Human intrusion</li> </ol> <p>In the first scenario the drop or falling of a container is examined in all possible moments till placing it in the cell and for each case is assessed the likelihood as an event. In ISAR is made a detailed analysis of this design basis accident for the established maximum content of various radionuclides in the RAW package and the corresponding drop height (4 to 12m). For a worker from the staff of the NDF (Category A) the maximum consequences are receiving individual effective dose of 0.789 mSv/a, assuming an average distance of about 30m from the package (technologically and administratively justified). It should not be forgotten that such design basis accidents can be controlled in time and apply appropriate protection measures that actually could help to significantly reduce this conservatively estimated individual dose. The potential surface contamination as a result of any design basis accident is also under full control.</p> <p>For a member of the population that is normally outside the perimeter of the site (on a distance of at least 150m –fence of the NDF), for a critical group &gt;17 years in this case of design basis accident, it is most conservatively estimated to receive individual effective dose of 0.062 mSv/a that is even below the license criterion of 0.1 mSv /a for normal operation. <b>For the population of the nearest residence place (distance of 2500m) the radiological impact is assessed as virtually non-existent.</b></p> <p>In the second scenario design basis accident, which could lead to the destruction of the structures of the repository, is a blast or explosion followed by a large fire as a result of targeting aircraft with big amount of fuel in the repository. Terrorist air attack scenario is very unlikely, as the NDF is located in the area of NPP "Kozloduy" and there is a protective shield (special security measures). It is therefore analyzed a terrorist act on the ground. In the analysis of the radiological consequences have</p>
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		<p>been made a number of conservative assumptions in order to increase the volume of exploded waste. For example, conservatively assuming that the waste package is on the ground surface (one reason or another it is not located in the cell) of the repository, without barriers around it to prevent the spread of radionuclides as a result of the blast.</p> <p><b>The results show that the effective dose of magnitude <math>10^{-3}</math> mSv is predicted for the boundaries of the site and beyond it the effective doses fall to <math>5.0 \times 10^{-4}</math> mSv. For the distance of 2500m (the nearest residence location), the impact is assessed as practically zero. Even the dose criterion for normal operation specified in the Permit HX-3593/ 04.05.2012 of the BNRA for design of the NDF is not exceeded.</b></p> <p><b>The total radiological impact (for design basis accidents) during the operation of the NDF on Radiana site is within the limits established in the legal framework, both for the staff of the NDF and for the population. In case of these accidents are not required immediate protective measures.</b></p>
34	The documentation has to be examined by an independent expert mission from IAEA	<p>As explained above, the final approval is carried out in a procedure different than the EIA procedure; final approval is subsequent and is performed by another authority. This authority has competence according to Act on the safe use of nuclear energy and Council Directive 2011/70 Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste; the authority holds the full responsibility of the licensing procedure and decides by himself whether there is a need of IAEA expert mission, expert support from competent international consultant or technical support organization.</p> <p>IAEA does not assess documentation related to EIA procedures.</p>
35	- Considering all the above, but also other projects in the nuclear field developed by both Romania and Bulgaria, we suggest the	Bulgaria reaffirms that it does not oppose the signing of a bilateral agreement with Romania. Nevertheless, we would like to emphasize that in 2008 the Republic of Bulgaria signed the Multilateral Agreement between the South Eastern European countries to implement the Convention on Environmental Impact Assessment in a

	<p>conclusion a bilateral agreement under art.8 of the Espoo Convention that could help both parties in better implementing the Convention, but also setting the ground for a model cooperation in this field in the world, taking into account the current status of cooperation on the basis of the existing bilateral agreements in the nuclear field between Bulgaria and Romania</p>	<p>Transboundary Context, which is in force for Bulgaria since 25.02.2011.</p> <p>Notwithstanding the aforementioned, the EIA Report from 2015 is elaborated on an advanced stage of NDF design development. Information that previously was not available, was developed in detail, analyzed and evaluated in the EIA report from 2015. See more answers to the questions to the letter from the Romanian party of 16 September 2011.</p>
<p><b>9<sup>th</sup> February 2012 regarding the previous EIA decision</b></p>		
<p><b>36</b></p>	<p>The final decision, in accordance with point 6(g) of the 5<sup>th</sup> MOP Decision V/4 on review of compliance, <u>should</u> “provide a summary of the comments received pursuant to article 3, paragraph 8, and article 4, paragraph 2, of the Convention and the outcome of the consultations as referred to in article 5, and should describe how they and the outcome of the environmental impact assessment have incorporated or otherwise addressed in the final decision, in the light of the reasonable alternatives described in the environmental impact assessment documentation”.</p>	<p>The EIA decision as an administrative act has a structure that complies with EPA (environment protection act) and EIA Ordinance. This structure and content of the administrative act will be also met in the decision to the EIA for the NDF, which will provide and record also the results of consultations with Romania in accordance with Art. 6 para. 1 of the Convention on Environmental Impact Assessment in a Transboundary Context</p>

<p><b>37</b></p>	<p>Under <i>Short description of the investment proposal</i>, item 5 of the “reasons”, the input from interested parties from both Bulgaria and Romania is addressed. This may be misleading in terms of understanding how the Romanian point of view and concerns were taken into account. Therefore we consider that the decision does not fulfill the considerations on which the decision is based, such as the position of the Romanian public and authorities. Item 5 does not reflect the real situation regarding the participation from the Romanian side, because in the framework of this procedure a number of around 600 public comments against the project was received. These opinions were transmitted to the Bulgarian side in due time</p>	<p>In addition to the answer to question 36, we would like to note that due to the huge volume of the EIA documentation, including in the part, related to the characteristics of the project, in the approved form and content of the EIA decision, a brief description is presented, which amount depends on the specifics of the project and main activities and facilities.</p> <p>Please note that a new decision on EIA is pending.</p>
<p><b>38</b></p>	<p>Under <i>For the Technical design phase</i>, items 2 and 6 provide for a control system for an early detection of radioactive emissions and elaboration of auto-monitoring plan. In accordance with our letter no 4126/LB/19.09.2011 and the</p>	<p>As stated in the Answer to Question 26, Bulgaria will submit periodically to the Romanian authorities summarized results from the monitoring in the monitoring zone of the NDF, which has a radius of less than 4 km around the repository. This text will be recorded in the EIA decision.</p> <p>In terms of bilateral consultations on the ISAR, we consider that at this stage in the EIA procedure, methodology and results are presented in sufficient volume in the updated EIA report from 2015 and therefore are not subject to future bilateral</p>

	<p>attachment to this letter, our request regarding the transmission to Romania of these results of the monitoring process was not provided in the text of the decision.</p> <p>Under <i>For the technical design phase</i>, under item 8, it is mentioned that an Intermediate Safety Analysis Report of NDF shall be prepared. However, there is no provision concerning future bilateral consultation with Romanian party, after the drafting process, as we have expressed in our final statement (letter no.4126/LB/19.09.2011 and the attachment to this letter), at item IV Nuclear Safety, first indent</p>	<p>consultations between the two countries.</p> <p>Please note that a new decision on EIA is pending.</p> <p>Bulgaria agrees in principle, if proven by Romania necessity, to conduct bilateral consultations after the decision on the EIA report, taking into account that FSAR (final safety assessment report) in Bulgaria is performed after the presence of a EIA decision entered in force.</p>
<p><b>39</b></p>	<p>Under <i>Before Commissioning</i> item 15 provides that analysis of the potential radiological impact on the population of Romania shall be carried out and sent to us in accordance with art.37 of the EURATOM Treaty (Article 37: Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever forms will make it possible to determine</p>	<p>All aspects of environmental impact, cumulative effects and transboundary impact are described in detail in the EIA Report and ADI report (Assessment of the degree of impact Report). The information that the Romanian party considered as missing in the previous EIA procedure, is included in the EIA Report from 2015. A new decision on the EIA is pending, which will correspond to national and international regulations on the environment, and we are remaining open to future joint actions.</p>

whether the implementation of such plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State). Taking into account that much of the information requested by the Romanian interested parties was not available (allegedly because it was not mandatory at this stage in accordance with the Bulgarian legislation) during the Espoo Convention consultations, we were in the position to accept the existing information and to provide you with a point of view. Taking into account that our point of view could not be based on all the information needed, we ask to maintain an open dialogue on all the issues of nuclear importance that were not clarified during the EIA transboundary procedure. We strongly reiterate this position because we believe that art.37 of the EURATOM, in principle (not being an environmental focused piece of legislation), excludes important factors such as biodiversity, valued species, areas of special environmental sensitivity or importance (wetlands, NATURA 2000



	etc.)	
40	<p>Under <i>Before Commissioning</i>, item 14 of the final decision, we did not find any reflection regarding items VI Emergency situations and VII Monitoring from our letter no. 4126/LB/19.09.2011 and the attachment to the letter, such as the intermediate notification of Romania, in case of emergency situation. We underline that this has to be taken into account in order to create a solid ground for our cooperation during unexpected and undesired events for this type of projects.</p> <p>The decision lacks strong provisions concerning immediate notification of Romania in case of serious events, such as: emergency situations, detection of radioactive leaks or exceeding radioactive limits.</p>	<p>Answer regarding VI Emergency situations</p> <p>As described in details in the answer to question 25, the creation of emergency plan is mandatory for the license holder – SERAW according to the Bulgarian legislation in the nuclear field. The actions of the competent authorities of the Republic of Bulgaria in emergency situations, including cooperation with the competent authorities of Romania and intermediate notification of Romania, in case of emergency situation, are already established, and in case of accidents, including and beyond design basis, radiological consequences are limited to the site boundaries of the NDF.</p> <p>However, Bulgaria will include in the text of the EIA decision that in case of a radiation accident at the site of the NDF, the Romanian authorities will be immediately informed.</p>
		<p>Answer regarding VII Monitoring</p> <p>As mentioned above, Bulgaria will submit periodically to the Romanian authorities the summarized results of monitoring in the monitoring zone of the NDF, which has a radius of less than 4 km around the NDF. This text will be included in the EIA decision.</p> <p>Please note that a new decision on EIA is pending.</p>
41	<p>Under <i>During the project implementation</i> item 18 of the final decision as referring to the implementation of the project which will be analyzed in accordance with the EIA Convention. This item must</p>	<p>A new decision on the EIA is pending, which will be in accordance with national and international regulations on the environment</p>

	include provisions on how Romania is going to be informed about the monitoring results	
<b>42</b>	Given these circumstances, we reiterate our request for the beginning of negotiations of a bilateral agreement under art.8 of the Espoo Convention focused on nuclear projects and the post project analysis of such projects	See answer to question 35.